

### **REMARKS/ARGUMENTS**

Claims 1-3, 5-6, 9-16, and 18-22 were pending in this application. Applicants note with appreciation that the Examiner has indicated in the August 10, 2004 Office Action that claims 1, 11, and 14 are allowed. The Examiner has also indicated in this Office Action that claims 2, 3, 5, 6, 9, 10, 12, 13, 16, and 18-22 are rejected. Applicants note that the Examiner did not specify in the Office Action that claim 15 is pending, but rejected the claim in Section 2. Applicants have not priorly canceled claim 15 and assume a typographical error was made and that claim 15 stands rejected.

In response to the Office Action, applicants have canceled claim 9 and have amended claims 2, 3, 5, 13, and 20. Accordingly, claims 2-3, 5-6, 10, 12-13, 15-16, and 18-22 are under consideration. Applicants maintain that the amendments do not introduce any new matter.

For consistency with the specification, applicants have amended Figure 2 to re-label element "64" as element "C4" and have amended Figures 3-4 to add the label "C4". Applicants are submitting with this Response a new set of formal drawings reflecting these changes and respectfully request that the replacement Figures be entered.

### **Rejection of Claims 2, 3, 5, 12, 13, 15, and 16 under 35 U.S.C. §103(a)**

The Examiner rejected priorly presented claims 2, 3, 5, 12, 13, 15, and 16 as unpatentable, 35 U.S.C. 103(a), over Baba et al., patent 6,071,755, June 6, 2000 (hereinafter Baba) in view of Tamaki et al., patent 6,157,080, December 5, 2000 (hereinafter Tamaki). Applicants respectfully disagree.

Beginning with claim 2, applicants have amended this claim to recite the "top surface" rather than the "first surface", which lacked antecedent basis. Accordingly, amended claim 2 now recites an "MCM device comprising a ... substrate having parallel top and bottom surfaces, a plurality of laterally displaced conductive vias extending between [the] top and bottom surfaces, a flip chip semiconductor die, ... and at least one passive component." Both the semiconductor die and passive component are "connected to respective/selective ones of [the] plurality of vias." Baba Figure 20, to which the Examiner makes reference, also teaches a structure with multiple semiconductor modules 31 and a passive module 53. However, rather than being connected to a substrate with vias, each of these modules connects to a laminated wiring layer 34 for connecting

to external circuits. This wiring layer 34 is layers of wires separated by insulation and as such, is not a substrate with conductive vias, as claim 2 recites. (Baba, column 12, lines 37-41). In fact, in the structure of Figure 20 Baba actually teaches away from using conductive vias (referred to as through holes by Baba), specifying that the use of a laminated wiring layer rather than vias improves the structure's resistance to moisture and prevents leakage between holes. (Baba, column 11, lines 26-28). Accordingly, Baba fails to teach or obviate an MCM device with "a plurality of laterally displaced conductive vias extending between [the] top and bottom surfaces" of a substrate, as claim 2 recites.

As important, amended claim 2 also recites that the "at least one passive component ... has at least one dimension which is longer than its other dimensions" and is "mounted on [the] top surface of [the] substrate with [the] at least one dimension disposed perpendicular to [the] top surface of [the] substrate." Significantly, while Baba teaches a passive element 53, Baba shows this element connected to the substrate such that the longer dimension is parallel with the substrate, rather than perpendicular. As such, Baba also fails to teach the perpendicular-orientation of passive components as claim 2 recites.

In addition, Baba also fails to obviate this perpendicular-orientation limitation. In particular, applicants note that this perpendicular-orientation of passive components is not a mere rearrangement of parts as shown by Baba. Note, for example, that the Specification at page 2, lines 8-9, states that the perpendicular-orientation of passive components maximizes the chip footprint ratio. In addition, the specification also describes the formation of fins in an insulation cap of the MCM device for heat dissipation. Significantly, the Specification further indicates that tall passive components are located between these fins to improve the thermal resistance of the package. (Specification, page 2, lines 10-12; page 4, lines 9-14). Contrary to applicants, Baba fails to provide any motivation for reorienting the passive device 53 to a perpendicular-orientation. In fact, Baba indicates that the teachings therein "[relate] to a semiconductor device capable of being made thin." (Baba, column 1, lines 9-10). Accordingly, it appears to applicants that the objective of Baba's teachings are actually counter to orienting the long dimension of a passive component perpendicular to a substrate.

As for Tamaki Figure 7E, to which the Examiner makes reference, Tamaki teaches a module with a single semiconductor device with top and bottom electrodes, but fails to teach or

suggest the limitations missing from Baba, in particular, a passive component “mounted on [the] top surface of [the] substrate with [the] at least one dimension disposed perpendicular to [the] top surface of [the] substrate.” Accordingly, the combination of Baba and Tamaki fail to teach or suggest claim 2.

Turning to independent claim 3, it priorly recited an “MCM device comprising a ... substrate having parallel top and bottom surfaces, a plurality of laterally displaced conductive vias extending between [the] top and bottom surfaces, ... [and two] flip chip semiconductor [dice] ... with electrodes ... connected to respective ones of [the] plurality of vias.” Applicants have amended claim 3 to now further recite that the MCM device comprises “at least one passive component ... connected to selected ones of [the] plurality of vias,” limitations originally recited by claim 5, which depends from claim 3. Again, the Examiner indicates that such limitations are taught by Baba and Tamaki. However, as indicated above, the combination of Baba and Tamaki teach a multi-chip structure that uses a laminated wiring layer rather than a substrate with conductive vias and as such, Baba and Tamaki fail to teach or suggest claim 3.

Amended claim 3 also priorly recited that the MCM device has an insulation cap with “a plurality of spaced fins.” Applicants have further amended claim 3 to recite that the passive component “is beneath [the] insulation cap” and “disposed laterally between adjacent fin valleys.” Applicants note that claim 10, which depends from independent claim 2, recites similar limitations and that the Examiner rejected claim 10 over Baba and Tamaki, and in further view of Nakamichi, Japanese Patent 410335544, December 18, 1998 (hereinafter, Nakamichi). In particular, the Examiner indicates with respect to claim 10 that Nakamichi teaches an insulation cap with fins and a component between these fins and that it would be obvious to add such fins to the covering 41 of Baba and to situate the passive device 53 there-between.

Applicants suggest that the combination of Baba, Tamaki, and Nakamichi also does not teach amended claim 3. Specifically, Nakamichi simply shows a semiconductor device beneath a plurality of fins/valleys formed within a covering (Nakamichi, Figure 1) and fails to teach specifically orienting the device and fins such that the device is “disposed laterally between adjacent fin valleys,” as claim 3 recites. In addition, Nakamichi fails to obviate orienting the passive device between adjacent fin valleys. Significantly, the orientation of the passive device between valleys is not a mere rearrangement of parts as shown by Baba, but is done to improve

thermal resistance while avoiding excessive package height. (Specification, page 2, lines 10-12; page 4, lines 9-14). Contrary to applicants, Nakamichi fails to provide any motivation for orienting the passive device between adjacent fin valleys. In fact, the obvious combination of Baba, Tamaki, and Nakamichi would be the semiconductor devices 31 and passive device 53 of Baba each disposed beneath a plurality of fins and valleys; but, this is not applicants' invention as recited by amended claim 3. As such, claim 3 is also not obviated by the combination of Baba, Tamaki, and Nakamichi.

Turning to claim 5, applicants have amended this claim to remove limitations that are now recited by claim 3. Applicants have also amended claim 5 to recite the "top surface" rather than the "first surface", which lacked antecedent basis. As such, amended claim 5 now recites that the passive component of claim 3 "has at least one dimension which is longer than another of its dimensions" and is "mounted on [the] top surface of [the] substrate with [the] at least one dimension disposed perpendicular to [the] top surface of [the] substrate." Again, for the same reasons as discussed above with respect to claim 2, the combination of Baba and Tamaki fail to teach or suggest the limitations of claim 5 making claim 5 nonobvious in view of the cited art.

Claims 12, 15, and 16 depend from amended independent claims 2 and 3 and are therefore novel and nonobvious in view of Bab and Tamaki for the same reasons as set forth above.

Applicants amended independent claim 13 to remove the word "the" for proper antecedent basis. Claim 13 now recites a "MCM device comprising a ... substrate ... and an insulation cap ... covering the top surface of [the] substrate, wherein [the] insulation cap has a peripheral rim which receives the outer peripheral edge of [the] substrate, and wherein adjacent vertical surfaces of [the] peripheral rim and [the] outer peripheral edge of [the] substrate have cooperating projections and depressions to define a mold lock," which limitations the Examiner indicates are taught by Baba Figure 20. In particular, the Examiner indicates that the top surface of substrate 34 contacting the bottom portion of cap 41 of Baba teach the claim 13 limitations. Applicants respectfully disagree. First, claim 13 recites that the rim of the cap and the edge of the substrate have adjacent vertical surfaces. As pointed out by the Examiner, the substrate and cap of Baba meet at horizontal surfaces, and as such, there is no vertical contact. As important, claim 13 also recites that the cap and substrate have "cooperating projections and depressions to define

a mold lock.” The Examiner does not point out, nor can applicants find, cooperating projections and depressions within the teachings of Baba or Tamaki. Accordingly, the combination of Baba and Tamaki fail to obviate claim 13.

**Rejection of Claims 6, 9, 10, and 18 under 35 U.S.C. §103(a)**

The Examiner rejected priorly presented claims 6, 9, 10, and 18 as unpatentable, 35 U.S.C. 103(a), over Baba and Tamaki and in further view of Nakamichi as related to Nakamichi’s teachings of an insulation cap with spaced fins. Applicants have canceled claim 9 because it recites limitations already recited by its parent claim 3. Claims 6, 10, and 18 depend from independent claim 2 and are thereby nonobvious in view of the cited art for the same reasons as above.

As for claim 10, in addition to including the limitations of claim 2, it recites that the “passive component [of claim 2] is disposed laterally between a respective pair of ... fins.” As indicated, these limitations are similar to those now recited by amended claim 3 and such, claim 10 is nonobvious in view of Baba, Tamaki and, Nakamichi for the same reasons as claim 3.

**Rejection of Claims 13 and 20-22 under 35 U.S.C. §103(a)**

The Examiner rejected priorly presented claims 13 and 20-22 as unpatentable, 35 U.S.C. 103(a), over Baba and Tamaki and in further view of Glenn, patent 6,586,667, July 1, 2003 (hereinafter Glenn). First, applicants have amended claim 20 to recite the “top surface” rather than the “first surface”, which lacked antecedent basis. As for the Examiner’s rejection, the Examiner indicates that Glenn teaches “rims and substrate having cooperating projections and depressions to define a mold lock” and that it is obvious to combine Glenn’s teachings with Baba and Tamaki, thereby teaching claim 13. Applicants respectfully disagree.

Significantly, Glenn teaches a system whereby a cap is locked to the die pad and leads of a device package and not a system whereby the cap is locked to a substrate, as recited by independent claim 13. In particular, Glenn puts a reentrant (groove) into the side surfaces of the die pads and leads. The encapsulant then fills the reentrants “thereby lock[ing] [the] die pad ... and leads ... to the encapsulant.” (Glenn, column 9, lines 8-19). However, this is not applicants’ invention wherein “wherein adjacent vertical surfaces of [the] peripheral rim [of the cap] and

[the] outer peripheral edge of [the] substrate have cooperating projections and depressions to define a mold lock,” as claim 13 recites. As such, Glenn fails to teach the limitations of claim 13 not found in Baba and Tamaki.

Note further that the package of Glenn does not even contain a substrate, as can be seen by Figure 17 to which the Examiner makes reference. Element 10 in Figure 17 is a plastic sheet used during manufacturing and is subsequently removed. (Glenn, column 6, lines 15-16). As such, there is no motivation to even modify the teachings of Glenn to create a mold lock between a substrate and cap through cooperating projections and depressions, as claim 13 recites. Such teachings are only provided by applicants. As such, claim 13, and amended claims 20-22 which depend therefrom, are nonobvious in view of Baba, Tamaki, and Glenn.

As for claim 20, in addition to including the limitations of claim 13, it also recites “at least one passive component [that] has at least one dimension which is longer than another of its dimensions, and wherein [the] at least one dimension is disposed perpendicular to [the] top surface of [the] substrate,” limitations similar to those of claim 2. As such, claim 20 is also nonobvious in view of the cited art for the same reasons as set forth above for claim 2.

As for claim 22, in addition to including the limitations of claim 13, it also recites that the “at least one passive component [of claim 20 and 13] is disposed laterally between a respective pair of [the] fins,” limitations similar to those of claims 3 and 10. As such, claim 22 is also nonobvious in view of the cited art for the same reasons as set forth above for claims 3 and 10.

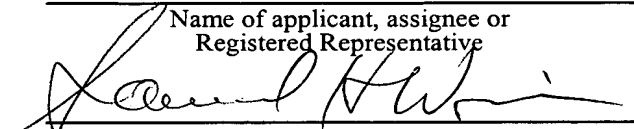
Since Baba, Tamaki, Nakamichi, and Glenn, do not teach or suggest, alone or in combination, applicants’ invention as now set forth in amended claims 2-3, 5-6, 10, 12-13, 15-16, and 18-22, applicants submit that these claims are clearly allowable. Favorable reconsideration and allowance of these claims are therefore requested.

Applicants earnestly believe that this application is now in condition to be passed to issue, and such action is also respectfully requested. However, if the Examiner deems it would in any way facilitate the prosecution of this application, he is invited to telephone applicants’ counsel at the number given below.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on November 1, 2004:

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Name of applicant, assignee or  
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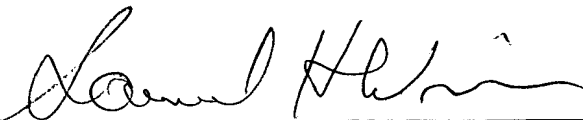
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Respectfully submitted,



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**AMENDMENT TO THE DRAWINGS**

Figures 2 - 4 have been amended. The attached sheets of formal drawings replace the original sheets including Figures 1-4.